

RESIDENTIAL LIGHTING

GENERAL ELECTRIC CO.

NELA PARK

CLEVELAND

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Mike Jackson, FAIA

FOREWORD

This publication presents a brief discussion of the new science of seeing together with its application to lighting principles in the home.

Obviously its scope does not justify its being a comprehensive manual, nor in its limited space does it solve all lighting problems. It is offered, however, as a brief lighting text for the solution of a number of commonly met situations in the lighting of the home.



RESIDENTIAL LIGHTING

THE NEW SCIENCE OF SEEING

To effectively dispel darkness has been a problem of mankind for many ages. It was, perhaps, first solved by a torch-like fagot. Pottery oil lamps, Betty lamps, candles, gas light all followed in the long crusade to eliminate darkness—and all had the same inconvenient and disagreeable characteristics. They had to be lighted by another flame; they had to be held in upright positions and away from walls and ceilings lest they set them on fire; they smoked and fumed.

Finally, a half-century ago, through research, a commercially practical incandescent lamp was invented. It was not odorous, nor did its use incur danger of fire and yet, even to this day, we continue to extensively use it protruded from the wall and suspended from the ceiling after the manner of open flame sources. Recognition of the new potentialities of the incandescent lamp which are far in advance of old types of light sources have been slow.

On the day of its birth, the incandescent lamp was hailed as the invincible opponent of darkness and as such has served this half-century.

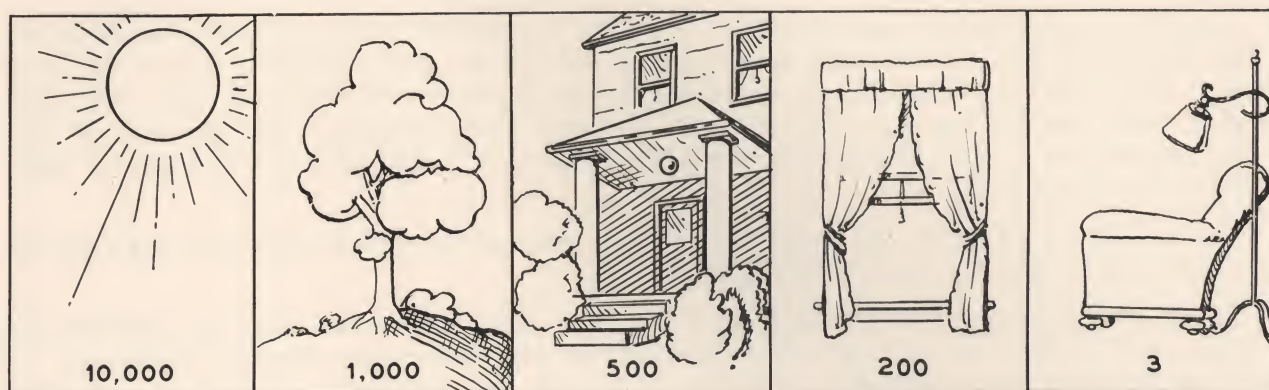
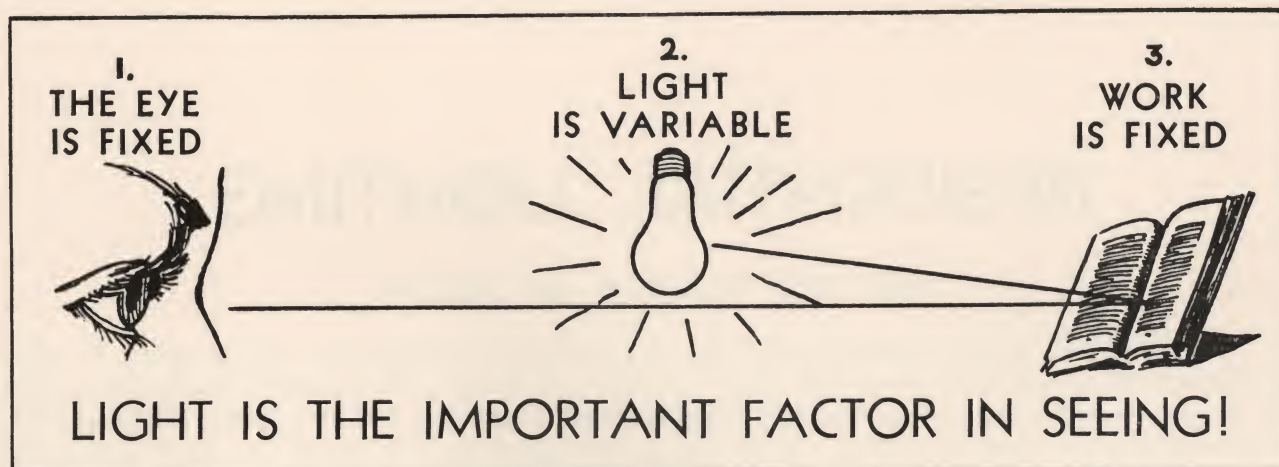
In recent years, again in the interests of mankind, it has been discovered that lighting has a great deal to do with seeing. The discovery of the partnership between light and vision has been incorporated into a Science of Seeing, which has brought reason and logic to the field of lighting which emphasizes the importance of its use.

As a background to this scientific reasoning is the story of eyes as they have existed for hundreds of thousands of years. For these many years that man has been developing he has been essentially an outdoor creature. His eyes, for instance, were evolved to function under the high illumination of daylight. He used his eyes primarily for long distance seeing and when the sun went down he went to bed. But modern civilization has made man essentially an indoor creature. As such, instead of distant vision, we more commonly use close vision, 15 to 30 inches. Instead of broad daylight, we have extremely low levels of both indoor natural and artificial light, and our work is comparatively small and detailed in size. We have, on the average, lengthened the working day and no longer retire at sunset, like our aborigines ancestors.

Modern civilization by its inventions has done much to make man's life more comfortable, but at the same time it has unknowingly placed greater burdens on the eyes. The Science of Seeing, by revealing clearly the direct relationship of lighting and vision, awakens us to the fact that too long eyes have been neglected and that it is not a difficult problem to assist them for their added duties.

There are three elements involved in the process of seeing. These are: the eye, the seeing task, and the light which makes it possible for the eye to see. We can do very little for the eyes themselves beyond sharpening them with the aid of glasses, if those eyes need such aid. Nor can the task be changed—be it a book to be read, typing to be done, a sketch to be drawn—the task is there to be accomplished and it is not in our power to make it different. Light, the third element, is completely variable and controllable. In order that it may truly become our "puppet," its qualities and quantities must be understood.

Nature is very generous with light and on a bright midsummer day may give us as many as 10,000 footcandles of illumination. Even in the shade of a tree there may be 1,000 footcandles. Here we might say is an ideal place to read. In the shade of a porch we find



SUNLIGHT TO LAMPLIGHT

reading comfortable in the 500 footcandles probably provided there. Nature invites us to work and play under 500; 1,000; 10,000 footcandles* of illumination.

We come indoors and find that at the window in the daytime there may be as many as 100 footcandles. But at night unfortunately too prevalent are the five footcandles from the average lamp in the house—less than one one-hundredth of the amount of light found in the shade of a tree. Partly to existing conditions as this, can be attributed the increasing percentage of defective vision among young people.

Between the ages of 20 and 30, man is in his physical prime. In this group are included the majority of our athletes. Does it not seem incongruous, then, that the percentage of defective vision should increase during that age period, from approximately 20% to 40%?

Not only are eyes suffering by working under poor illumination, but also human bodies. From the studies of scientific research it has evolved that poor lighting is not only straining eyes, but draining nervous energy from bodies, resulting in fatigue, headaches and a condition of general inertia. Good lighting, on the other hand, besides saving eyesight, is a matter of stopping needless waste of nervous energy. The statement has been made that an office worker who uses his eyes all day under inadequate light may be actually more tired at night than the man who spends a day digging ditches. The Science of Seeing indicates quite clearly that it does take nervous energy to see, and that seeing consumes nervous energy just as definitely as digging ditches or washing dishes.

Suppose you drive an automobile for 50 miles on a bright sunny day over a straight piece of road. At the end of the ride you notice no particular exhaustion. Then take the same

*A footcandle is the amount of light a candle casts on a surface one foot away.

automobile, the same road, and make the same drive at night—in a fog. After 50 miles of this you experience fatigue. But the only difference has been the lighting. You have gripped the wheel, your muscles strained your whole body, not doing any useful work but using nervous energy in merely trying to see.

Four factors are concerned in the perception of an object—the size of the object, the contrast between the object and its surroundings, time and brightness or light shining on the object. The first three of these factors are usually more or less uncontrollable in any specific instance; the fourth, brightness or the amount of light, can be controlled, and its specification may be formulated to best compensate for the uncontrollable factors.

A typical ideal situation would be to have books which could be, if, for example, easily read when twenty feet away. But like most ideal situations, it would be very impracticable. We must, therefore, content ourselves with the books we have and apply proper light, thereby enabling us to see small objects with greater ease with its increasing intensities.

Where contrast is low, light will compensate for this lack of distinct contrast and we read with ease comparable to reading where contrast is high. Reading a newspaper, for example, wherein contrast between the type and the paper is not nearly so great as exists in a well-printed book, requires two and three times more light than the reading of the book. High intensities of lighting also serve for sewing where often there is little or no contrast between the thread and the material.

Light is also a co-partner of time in speed and accuracy of vision. The eyes require longer time to see clearly where the illumination is low.

Light is our tool. In the hands of one who recognizes its subtleties and at the same time its seeing values, lighting may be deftly molded to be effectively appealing to the eyes as well as beneficial.

The modern concept of purposeful lighting considers quantity and quality first, and consistently makes every effort to supply quantity values in accordance with the visual tasks to be performed. Values established in accordance with specific visual occupations are materially greater than those now commonly employed and their usage may readily create the erroneous impression of "too much light." This latter impression has long been associated with even the low and inadequate values of artificial light and when improved quantitative standards are employed, this negative impression may rapidly increase. For example, the evening newspaper, illuminated at night to one-fifteenth the value found on the porch in the afternoon, seems to be far more brightly lighted than it did in the afternoon and its general acceptance may be questionable—simply because one of Nature's lessons has not yet been generally adopted in the lighting of our homes. Nature on the porch did not "spot-light" the page, leaving the rest of the porch in semi-darkness and accordingly the 500 to 1,000 footcandles of lighting were quite agreeable and satisfying. Nature's normal lighting contrasts, exclusive of the direct viewing of the sun itself, or its direct reflection from water

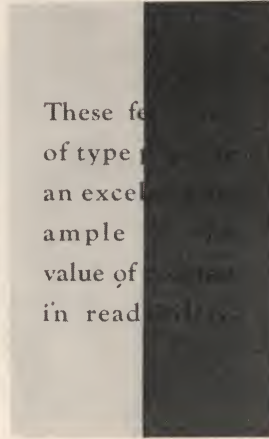
SIZE



BRIGHTNESS



CONTRAST



TIME



and snow, are mild and agreeable, whereas much of our indoor lighting creates contrasts way beyond those found in nature. The quality of lighting takes on, therefore, a greater significance with each forward step in the production of artificial light and its utilization.

Having been made aware of Nature's abundant provision of light for our eyes, it is readily acknowledged that too much light, that is, too great a quantity of light, is hardly possible for us to attain indoors.

Inasmuch as low "oil-lamp" intensities have been for too many years predominating, the following table of recommended intensities for the home is offered as a conservative step in the fulfillment of light for seeing requirements. The severity of the task, the duration of eye application, and a number of other governing factors are all combined with this foot-candle scale of effectiveness in producing this table.

These are approved by the Illuminating Engineering Society.

	Footcandles
Reading	
Prolonged periods of fine type.....	20-50
Ordinary reading	10-20
Sewing	
Fine needlework on dark goods.....	100 or more
Prolonged average sewing.....	50-100
Prolonged sewing on light goods.....	20-50
Ordinary sewing on light goods.....	10-20
Writing (Ordinary).....	10-20
Card Playing	5-10
Children's Study Table	20-50
Dining Room	
When used for ordinary reading or writing rather than for ordinary dining.....	10-20
Kitchen	
General	5-10
Local at work counters and sink.....	10-20
Bedroom	
General	2-5
Bedlight	10-20
Dresser, vanity and dressing table mirrors*.....	10-30
Sewing Machine	20-50
Bathroom—Mirror*	10-30
Children's Play Room	
General	5-10
Local	10-20
Stairways and Stair Landings.....	2-5
Workbench	10-30
Ironing Machine, Ironing Board and Laundry Trays	10-20

*Intensity value delivered on each side of face.

These intensities, however, coming primarily from portable lamps, or other localized lighting units in a room, without any general illumination surrounding them, may create complaints of "too much light," and such complaints would, no doubt, be justified. "Too much light" in this case would in reality refer not to the quantity of light, but to a poor distribution and diffusion of this light.

Recalling our example in Nature, we find Nature provided her 500-1000 footcandles of light over a large area and not in one concentrated spot, leaving our surroundings in darkness. Likewise, indoor surroundings should be generally lighted with the softness of Nature's lighting, eliminating harsh shadows and contrast by an expert diffusion of light. Through the use of indirect lighting is achieved a quality of lighting comparable to Nature. With the ceiling and walls of our room transformed into a sky of diffused light, direct local light no longer seems concentrated and spotty. For eye comfort, a ratio of ten to one for minimum contrast has been introduced by the Science of Seeing principles. For example, if at a desk there are ten footcandles of light provided by a desk lamp, there should be in the surrounding area of the room, one footcandle of light. By providing all portable lamps with open-top shades (to allow some of the light to be reflected upward), by using indirect portable lamps and ceiling and wall fixtures, this general lighting may readily be acquired.

LIGHTING FIXTURE RECIPES FOR THE HOME

To be in harmony with architectural structure and decorative treatment in the home and to provide a source of comfortable general lighting should be the dual purpose of centrally placed lighting fixtures. Lighting fixtures may also supply adequate seeing intensities of lighting, however, the positioning of such fixtures must be localized with respect to the area to be lighted. Brackets on each side of the bathroom mirror, work lights over the sink and dishwasher, over the range, over laundry trays, and ironing machine all illustrate this type of fixture usage. Centrally placed fixtures may be considered to serve for movement throughout the room, for decorative effects and for reducing the contrast that localized light from portable lamps or other local area lighting so often produces in a room where general lighting is not provided.

The lighting from fixtures may be classified as direct, indirect, or semi-indirect. The direct is exemplified by a fixture whose shade is open at the bottom directing all of the light downward. Indirect fixtures direct light upward such as an opaque bowl suspended from the ceiling directing the light upward to be reflected from the ceiling and walls. Semi-indirect combines both effects—and may be typically represented by a suspended bowl of diffusing glass—the light being directed upward through the open top and downward through its translucent glass.

Entrance Porch

The charm of a carefully planned home is first revealed in its entrance. Although the requirements to be met are simple, the selection of a type of porch lighting which is correct both architecturally and from an illumination standpoint merits considerable thought. A good porch-bracket or wall-lantern will brighten the doorway, emphasizing its architectural details, light the faces of guests, and insure that the steps will be clearly seen. A single unit over the doorway or in the ceiling of the porch may prove satisfactory, but two units, one on each side of the entrance are quite often preferable. If the fixture is made of copper it will not mar the wall with rust streaks. Fixtures which provide light through a bottom opening materially assist in step lighting and also the face of the evening caller.

An illuminated house number is a convenience that may well be part of the hospitable home. This feature may be incorporated into the porch lighting unit itself, or a separate illuminated number may be used operated by a low-wattage lamp. Otherwise the number should be so placed that it is illuminated by the entrance light. Side and rear porches each call for their individual lights. A single fixture on the door opening side is suggested.

TYPICAL GOOD LIGHTING EQUIPMENT FOR BASEMENT



100 TO 150 WATT LAMP



60 TO 100 WATT LAMP



40 TO 60 WATT LAMP



100 TO 150 WATT LAMP

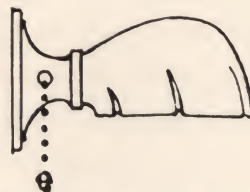
TYPICAL GOOD LIGHTING EQUIPMENT FOR KITCHEN



DIRECT
100 TO 150 WATT LAMP



SEMI-INDIRECT
100 TO 150 WATT LAMP



40 TO 60 WATT LAMP



40 TO 60 WATT LAMP

TYPICAL GOOD LIGHTING EQUIPMENT FOR EXTERIOR



40 TO 60 WATT LAMP



40 TO 60 WATT LAMP



15 TO 25 WATT LAMP



40 TO 60 WATT LAMP



40 TO 60 WATT LAMP

When the top tread of the steps is more than nine feet from a point on the porch floor directly beneath the lighting outlet, the steps are usually in shadow. Additional fixtures are therefore required.

Halls

The lantern type of fixture is frequently used, those forms which employ clear glass panels or lightly etched glass are nearly always unpleasantly bright and a cold, harsh lighting results from their use. Glass of such diffusion that lamp bulbs are invisible when lighted reduce this brightness of fixture with consequent softening of lighting effect. Shallow enclosing bowls of good diffusing glass placed at the ceiling may be used. In small halls they often assist in creating spaciousness.

For an upper hallway particularly over open stairways the fixture should provide some direct downward light thereby supplying light for the stairway.

Living Room

A variety of activities takes place in the living room and for this reason the lighting in this room should be flexible—at least so flexible as to provide several levels of lighting—a moderate intensity for conversation or radio-listening—a second level for reading and other individual seeing tasks for which high intensities of localized light supplemented with some general lighting—and third, a higher value of lighting for several tables of bridge or for the festive gathering of a larger group of people.

The first, conversational level of light may be afforded by portable lamps—a low level of general illumination being obtained through the lamps whose shades are open at the top. New types of indirect floor lamps having two filaments are especially effective, in this case with the low filament in use.

For light to be generally distributed over a room, ceiling fixtures may be used.

The low-ceilinged room apparently maintains its size and attractiveness best when the fixture selected is to hang close to the ceiling. Boxes, round, square or rectangular, of good diffusing glass provide the minimum of projection into the room. The close-hung ceiling-shower also serves. The higher-ceilinged room allows somewhat more choice in selection—for it permits a fixture to suspend from a few inches to as much as a few feet from it. The shaded-candle fixture or any semi-indirect fixture is then usable. In any case, the ceiling fixture should usually include a total of 200-watts.

Owing to their position, wall-brackets or pockets are sources of discomfort if they are not shaded. Their chief purpose in the living room is to be sources of decoration and for secondary values of general lighting. Symmetrical and balanced placing of brackets produces balanced secondary lighting.

Sun Room

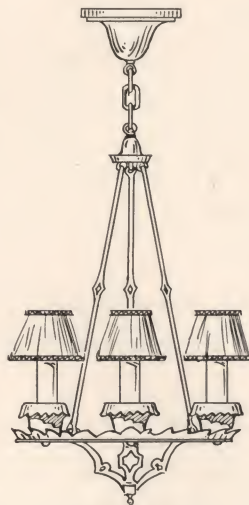
The sun room, being colorful and cheerful may easily be made one of the most attractive rooms in the house as inviting after dark as by day.

General illumination may be supplied by a ceiling fixture which provides indirect or semi-indirect lighting. Artificial flower boxes or small cove strips mounted above the window and door openings and fitted with reflectors and lamps, will also furnish a pleasing indirect lighting effect. Local lighting for reading, studying or sewing is provided with portable lamps chosen with these services in mind.

TYPICAL GOOD LIGHTING
EQUIPMENT FOR HALL, PASSAGE WAYS AND CLOSETS



60 TO 100
WATT LAMP



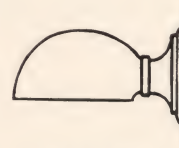
3-40 WATT
LAMPS



60 TO 100
WATT LAMP

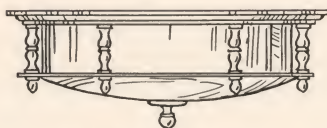


40 TO 60
WATT LAMP

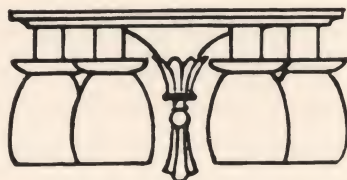


25 TO 60
WATT LAMP

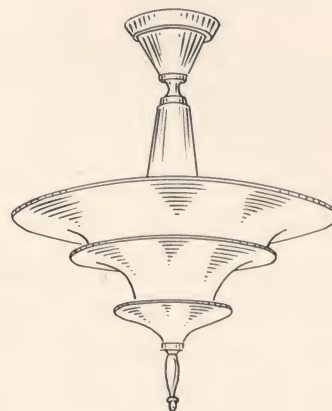
TYPICAL GOOD LIGHTING EQUIPMENT FOR THE LIVING ROOM AND LIBRARY



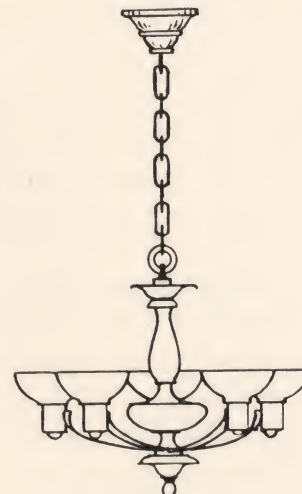
4-40 WATT LAMPS



5-40 WATT LAMPS

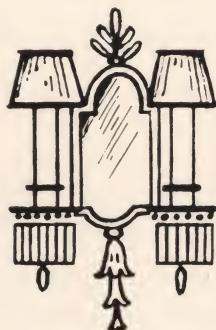


100-150
WATT LAMP



5-40 WATT LAMPS

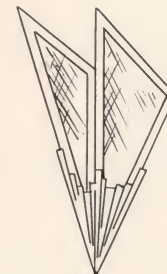
TYPICAL DECORATIVE WALL-BRACKETS



2-15 TO 25
WATT LAMPS



25 TO 60
WATT LAMP



25 WATT
TUBULAR LAMP

Dining Room

A good dining room fixture will fulfill two major requirements if it is the sole source of light, namely, to furnish light for the table and to illuminate the faces of the diners, and illuminate to a lesser amount the ceiling and walls, thereby reducing excessive contrasts and facilitating service. Unshaded and inadequately shaded lamps are invariably glaring and must be avoided.

The five or six-light candle fixture has been used extensively and when shaded 40-watt lamps are employed the major requirements set forth are reasonably well met. Some past practice hung these fixtures either too high or too low. The shaded lamps should be approximately four feet above the table.

The semi-indirect type of fixture using dense glass has its place too in the dining room, although it does not primarily light the table. This kind of fixture gives even, general illumination throughout the room, but has a tendency to be monotonous, although it has a very definite place in the home in which the children or other members of the family use this room for study purposes. If the fixture has but one socket, a 200 watt lamp is usually necessary to provide the intensities of lighting for reading, and in the case of multiple sockets, equivalent wattage with several lamps would be supplied.

While modern adaptations of the old style dome have not been extensively developed it is interesting to consider since it provides predominance of light on the table top with lower amounts of light throughout the rest of the room. When hung at the proper height (so that the eyes of the diners do not see the lamp bulb or too much of the inner surface of the dome which may be bright) its desirable qualities are assured. With proper consideration to design the lighting effectiveness of the dome may be obtained from fixtures which range all of the way from those partly imbedded in the ceiling to those suspended but several feet above the table top. Usually the flush-in-the-ceiling fixture provides some harshness since there is little or no contrast relieving light throughout the room. Supplementary general lighting may be provided with wall fixtures, shaded candle-types or simple wall pockets placed symmetrically, preferably in balanced pairs. Small continuous coves or intermittent cove strips placed over door and window openings will also provide the necessary general softening lighting.

Special units, usually combinations of these three types just mentioned, often combine the advantages of each and eliminate their disadvantages. For example, a fixture may be designed to incorporate a central direct-lighting component artistically embodied in the fixture, furnishing light for the table; an indirect component furnishing general lighting for the room; and in addition a number of light-source areas affording the decorative touch which is so desirable.

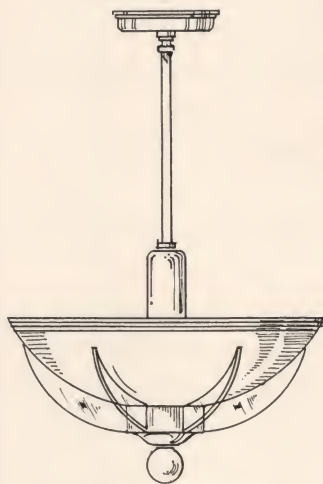
For those people who prefer to eat by the charming flickering light of wax candles shaded wall-brackets or pockets may be used to provide the supplementary general illumination in the room.

The breakfast nook in reality a miniature dining room, may be made cheerful by a small dome-type unit of a sunny hue. Observe the same rules for the hanging as set forth for the dining room dome.

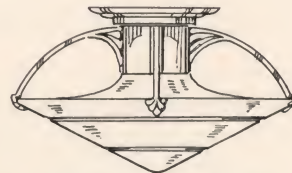
Kitchen

Plenty of well-diffused light is needed in the kitchen. If the room is of moderate size, one diffusing-glass enclosed unit at the center of the ceiling will furnish good general illumination. Either a 100-watt clear MAZDA lamp or a 150-watt MAZDA daylight lamp should

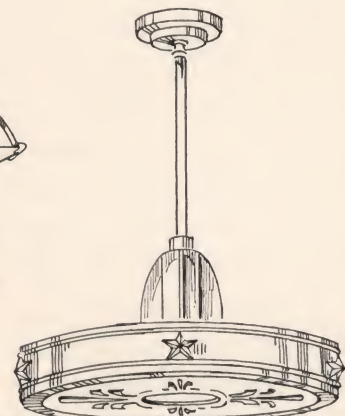
TYPICAL GOOD LIGHTING EQUIPMENT FOR DINING ROOM



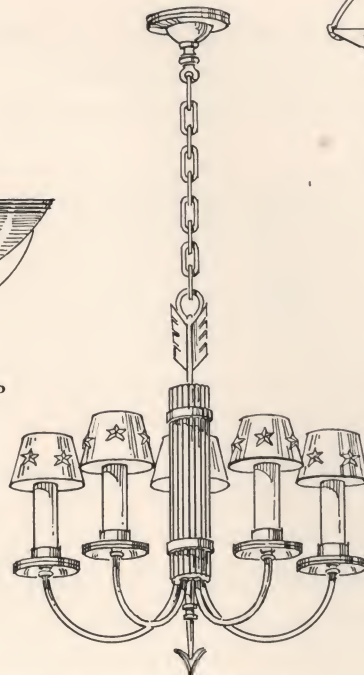
1-200 WATT LAMP



1-100 WATT LAMP
OR
1-150 WATT LAMP

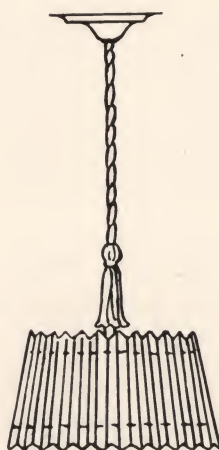


1-100 WATT LAMP
4-25 WATT LAMPS



5-40 WATT LAMPS

TYPICAL GOOD LIGHTING EQUIPMENT FOR BREAKFAST ROOM



60 TO 100 WATT LAMP



3-25 TO 40
WATT LAMPS



60 TO 100
WATT LAMP

be used. The daylight quality of light is to be preferred because of the more natural color it imparts to foodstuffs, and also, if ironing is done in the kitchen, scorching may be more readily detected under light of this color.

Additional local work light will be needed over the range and sink as well as over other working counters which are located along the walls of the kitchen. This lighting may be supplied by glass shaded brackets. When bright metal counters are used local lighting fixtures which throw most of their light to the bottom of the white surfaced upper cabinets are suggested since direct lighting glass reflectors create annoying bright images of the light source in the eyes of the worker from the surface of the metal. The soffit unit over bright metal surfaced sinks, dishwashers and ranges is to be preferred for the above reason. At the same time great freedom from shadow is obtained.

Bedroom

The most desirable type of ceiling fixture for the bedroom is one which has a low brightness and consequently, is comfortable to the eyes of one lying in bed. Large surfaced diffusing glass globes, preferably twelve inches in diameter may be used with a 100-watt lamp. Higher degrees of satisfactoriness results from single or multiple bowl semi-indirect fixtures. The totally indirect fixture affords the maximum of softness and low brightness.

When fixed positioning of furniture is assured and the actual size of the several pieces of bedroom furniture is known, brackets for utility purpose such as the lighting of mirrored furniture may be used. The position of the face with respect to mirror governs the height of these fixtures. (See Bathroom). Properly selected portable lamps allow complete flexibility.

The children's room should be painstakingly lighted in order that these young eyes may not be subjected to uncomfortable brightness. The lighting units should be of the indirect or very dense semi-indirect type.

A night-light placed in a convenience outlet preferably near a door of the room—provides enough light on the floor to enable one to conveniently find his way at night from one bedroom to another. Similar lamps render this service for hallways and bathrooms.

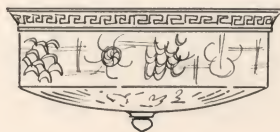
Closets

Clothes closets can be well lighted by a bracket light inside and above the door (on the opening side) controlled by a pull-chain switch or by an automatic door-operated switch. The bracket should be mounted, not over the center of the door, but toward the knob side, so that the cord will be out of the way. A lamp of 60 or 100 watts may be used at trifling expense to provide light around crowded clothes, and on the floor for shoes, because of the fact that it is used but a few hours a year.

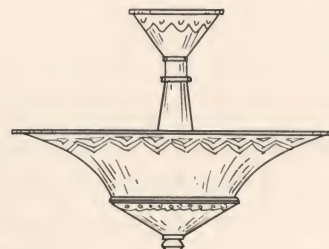
Bathroom

In bathrooms of moderate size proper light at the mirror will serve to illuminate the entire room. This may be accomplished by two upright brackets whose glass shades are open at the top—these in order to be in line with the face of a person looking into the mirror should be between 60 and 66 inches from the floor. Tubular glass shaded fixtures in which are used tubular lamps at each side of the mirror are also highly commendable. Good separation of both types minimize the inherent glare due to these brackets being on a level with the eyes. Very light ceilings are very desirable so that ones hair may be arranged from light reflected downward. Tubular brackets are usually low in the amount of light sent upward and therefore need overhead light to complete this service.

TYPICAL GOOD LIGHTING EQUIPMENT FOR BED ROOM



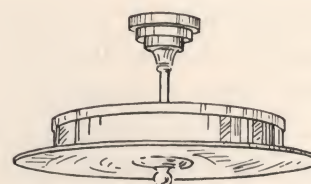
3-40
WATT LAMPS



100
WATT LAMP

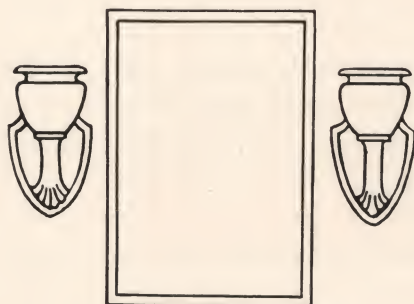


3-25 TO 40
WATT LAMPS

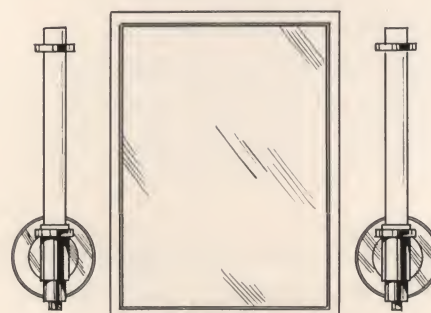


3-40 WATT LAMPS
4-40 WATT LAMPS

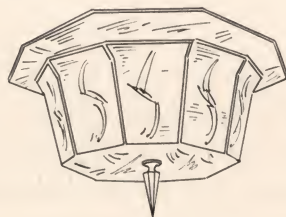
TYPICAL GOOD LIGHTING EQUIPMENT FOR BATH ROOM



40 TO 60 WATT LAMPS



TUBULAR LAMPS
40 WATTS EACH



2-40
WATT LAMPS



SUNLAMP
TYPE S-2



Light concentrated on the table top comes from the fixture which is equipped with a reflector imbedded in the ceiling. Cove strips over the windows provide a low value of general lighting.



Each piece of furniture is provided with its own localized lighting, the piano with a lighted music rack.



The Illuminating Engineering Society study and reading lamps supply adequate values of softened lighting over a wide area for reading, writing and other close visual work.

Simple upturned shaded brackets, face-height, provide for the bathroom mirror.



Face-height vanity lamps, a twin-arm bed-table lamp, and a simple drum of diffusing glass at the ceiling provide for the lighting needs of this room.



Larger bathrooms require a central ceiling fixture (enclosing white glass globe) for general lighting. Enclosed shower stalls require individual vapor proof units at the ceiling.

Basement

An enclosing glass unit, similar to the kitchen unit, controlled from the head of the stairs, can often be so placed as to light both the furnace and the stairway. The fruit-storage room and coal bins should have their own lamps. Use 60-100 watt lamps in these fixtures.

The lighting of the laundry should be given its rightful consideration, for the very thorough and careful work which must be done there needs every lighting advantage. Since the light from daylight lamps is of such a color quality as to render dirt and scorches more readily apparent, these lamps are recommended for laundry use. Two enclosing globes, each fitted with a 150-watt daylight lamp, are needed to perform adequate service. One should be hung directly over the tubs and the second directly over the ironing location.

The work bench can be satisfactorily lighted by such an enclosing glass globe mounted at the ceiling and far enough from the wall so that work clamped in the vise will not be in shadow. This will usually be about $1\frac{1}{2}$ to 2 feet from the wall. A 100-watt lamp should be used. If the bench is more than 6 feet long, two such units are very desirable.

The recreation room, which is usually long, narrow, and low-ceilinged, is best equipped with two shallow, enclosing ceiling fixtures (100 watts each) hung close to the ceiling or even recessed in it. Due to the prevalence of low ceilings, semi-indirect wall brackets can also serve equally well. Suitably decorative wall brackets add atmosphere, and if the room is used frequently as a card room, one or two of the indirect floor lamps will prove indispensable. Since the ceiling fixtures may also serve for the game, ping pong or billiard table the placing of these fixtures should be such as to take into account the length of these tables.

Attic

The finished attic may be made as usable as any other room of the home simply by a proper choice of the lighting equipment. For maids' quarters or as a spare bedroom the suggestions given under bedroom lighting should be followed. For the unfinished attic which generally functions as a storeroom simple white glass shades with 60-watt inside frosted lamps mounted on the ceiling generally suffice.

Garage

An economical and efficient means of lighting the garage is by enclosing white glass globes or porcelain enamel reflectors—the RLM dome type—mounted at the ceiling for either arrangement discussed under wiring suggestions for the garage. A 100-watt lamp is used in either type of reflector.

THE SELECTION AND PLACING OF PORTABLE LAMPS

The selection of portable lamps is dependent upon two viewpoints—the decorative and utilitarian. The former is largely a matter of individual taste; the latter based upon definite lighting requirements, but every lamp may be selected to fulfill both, by being artistic as well as capable of performing certain lighting functions.

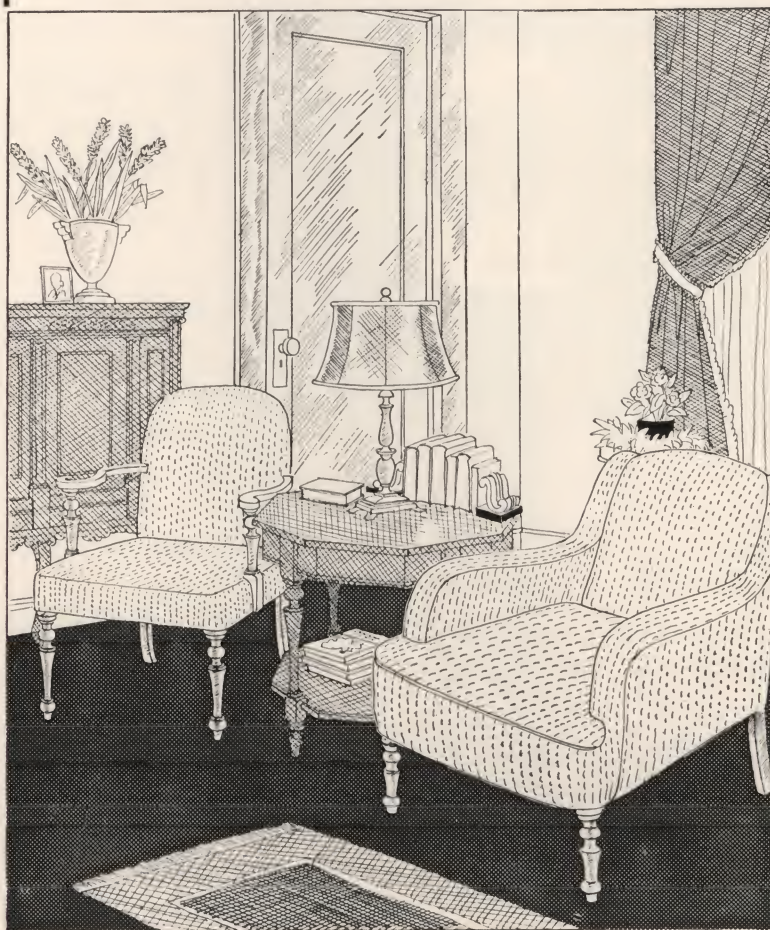
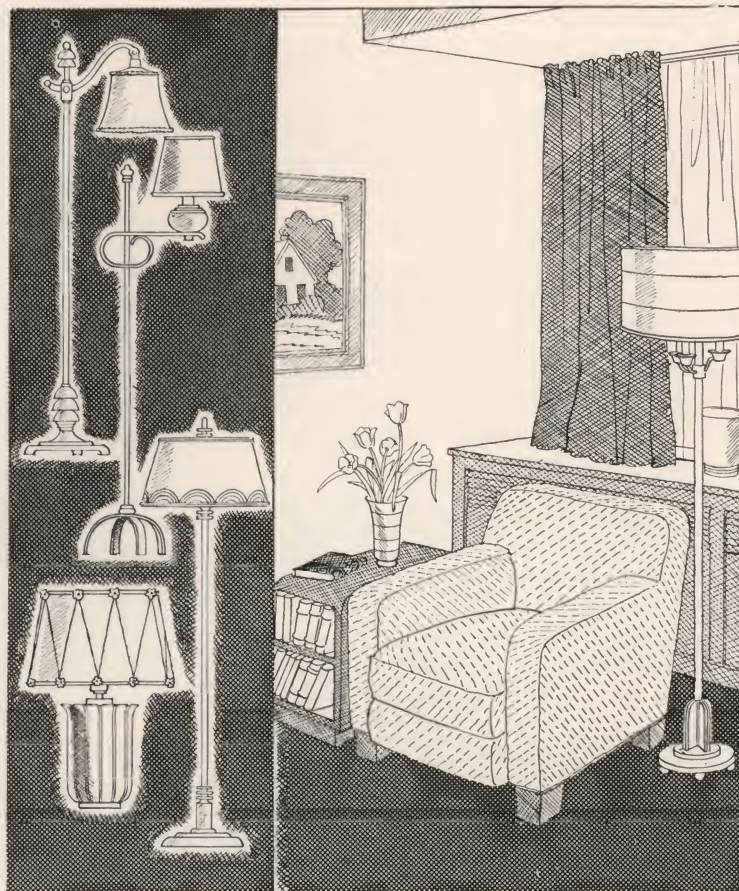
The factors to be considered in selecting a portable lamp to meet seeing requirements are:

1. The height of the lamp base—

The lamp base should be of adequate height to accommodate a shade of ample dimensions.

The base height determines in part the spread of the light and should be adjusted to the furniture beside which it is used, in order that at no time are bare lamp bulbs visible. A lamp to be placed on a high end

Homes are made much more livable when portable lamps are properly selected and placed. The easy chair is really "easy" when accompanied by a semi-indirect lamp equipped with the new "Indirect Three-Lite" MAZDA lamp, also 40 or 60 watt lamps if there are candle sockets. Other acceptable lamps shown in the panel.



Among good family traits every table lamp should have sufficient height, spread of light and correct wattage. A tape measure will tell you if yours is 23 to 26 inches tall, with shade 16 or 18 inches wide at the bottom. Two 60 or 75-watt bulbs are needed in the two-socket lamp and 100 watts of course for the Illuminating Engineering Society study and reading lamp.

table of 30" or more may be shorter than the lamp to be placed on a low end table whose height is about 24". (See Portable Lamp Description, Page 24.) The shaft of a floor lamp may be adjustable, thereby increasing its usefulness.

2. Adjustability of sockets and their number—

It is preferable that sockets in lamps be adjustable in order that they may be coordinated with the shade of the lamp to eliminate the possibility of lamp bulbs from being exposed beneath the shade and contacting the line of vision of people in the room—and to provide a maximum amount of light from the lamp. It is recommended that at least several lamps in a room be equipped with more than one socket so as to provide a certain flexibility in the lighting. When the room is being used merely as a setting for conversation, it may be desirable only to have one of the sockets in these lamps turned on, whereas all sockets should be in use when the lamps are being used for reading or sewing purposes.

3. The color, shape and size of the shade—

All shades should have white or very light linings; white shades are normally better suited to rooms whose walls and furnishings are light. Lamp shades in a darkly furnished room should harmonize with the color scheme in their exterior coloring.

Open-top shades are highly desirable. The open top allows some light to be reflected into the room to provide general illumination, which is necessary for eye comfort as well as room balance. When a portable lamp is strategically placed beneath a painting or mural, the light through the top may be most effectively put to use in lighting the painting.

Size (diameter and depth) is approximately described in the Portable Lamp Description Table.

Portable lamps are the most mobile and convenient means of providing localized lighting, yet the very fact of their portability makes it necessary that care be taken in their correct placing.

Coordinated with the characteristics of a lamp itself, is the placing of lamps with respect to various types of furniture. The principal objective in placing a lamp is to so locate it that it provides adequate footcandles of light for seeing tasks and at the same time that bare lamp bulbs do not contact the line of vision of anyone seated in the room.

Portable Lamps in the Entrance Hall

Entrance halls rarely have space enough for portable lamps of any size other than the decorative type on a small hall table. Often, however, the decorative indirect torchiere is adaptable either in pairs placed at each end of the large tapestry or mirror, or used singly wherever light is desired.

In the Living Room

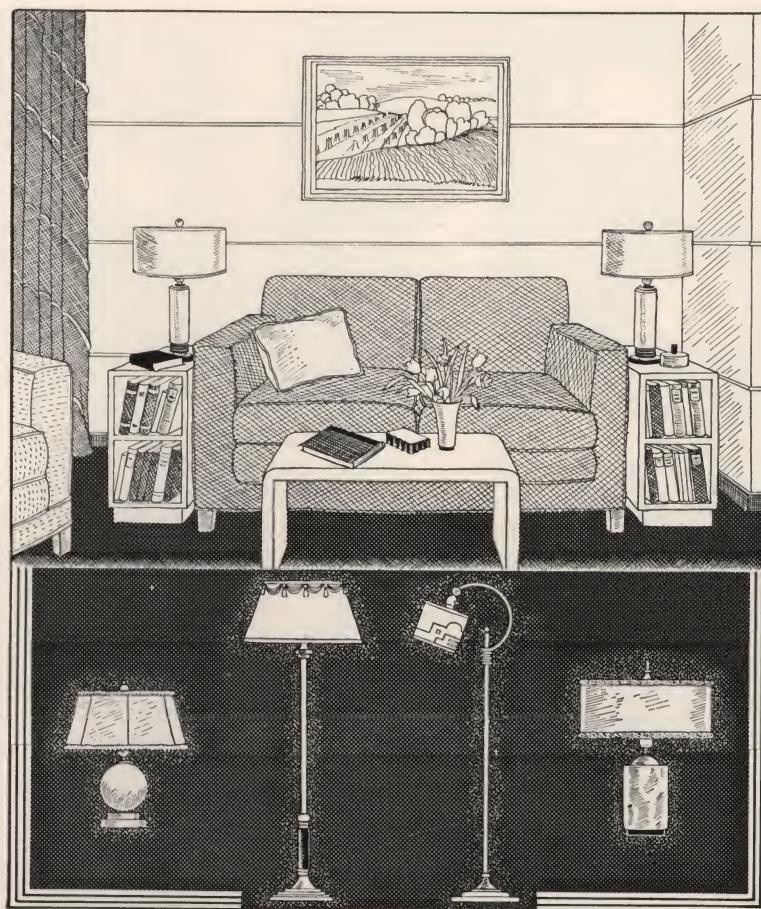
Inasmuch as the average living room of today must serve so many purposes, it requires the use of more portable lamps than any other room in the home.

Light for a reading chair may be provided by almost any type of portable lamp, as sketched. Both type of bridge lamps, either with upturned or downturned socket may be used, particularly so when equipped with an adjustable base, and should be placed at either side of a chair, the left side if it is to furnish light for sewing. The junior or large floor lamp, with direct and indirect light units, or the lounge lamp, is also adaptable for lighting a chair and should be placed slightly to the rear at one side of the chair.

Table lamps, end table or living room table size, may be effectively used beside reading chairs. Note the base dimensions for high and low end tables in the portable lamp description chart.

A balanced arrangement is introduced into a living room when the davenport is lighted by twin table lamps on end tables, one at each end. At the same time, an equality of lighting is afforded persons seated at either end. A pair of twin lounge lamps with adjustable bases may furnish an attractive as well as useful way of lighting a settee or davenport. Wall portable lamps hung on the wall at each end of the davenport are also suitable.

The davenport placed against the wall calls for a pair of lamps, either table or floor models as shown. The twin lamps pictured here are each equipped with two 60-watt bulbs. Their standards are high enough to give sufficient spread of light and yet not so tall that raw light strikes the eyes from under the shades.



When the davenport stands away from the wall, along the fireside for example, only one lamp need be used, center back. Its ability to endow the davenport's entire length with good light comes from the "Indirect Three-Lite" MAZDA lamp in a glass bowl inside the shade. This is another Illuminating Engineering Society specification model.

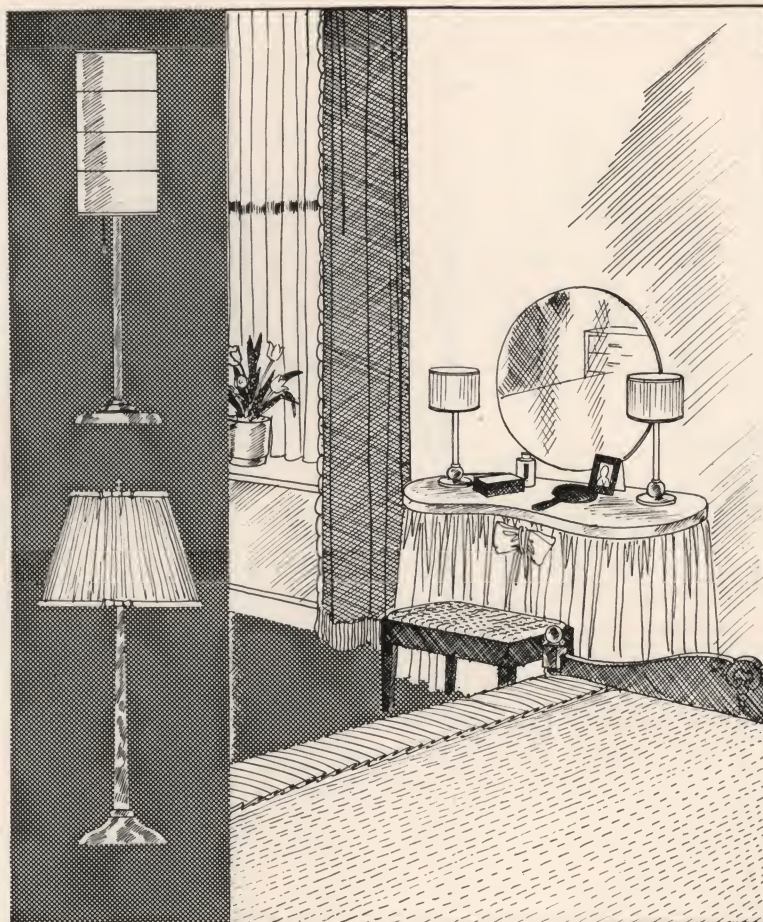


It's a New Deal in lighting comfort when the I. E. S. Better Sight Study and Reading Lamp is placed on desk or table. The lamp is made by many manufacturers according to specifications of the Illuminating Engineering Society. Look for its approval tag. Additional models of this lamp are illustrated, left.

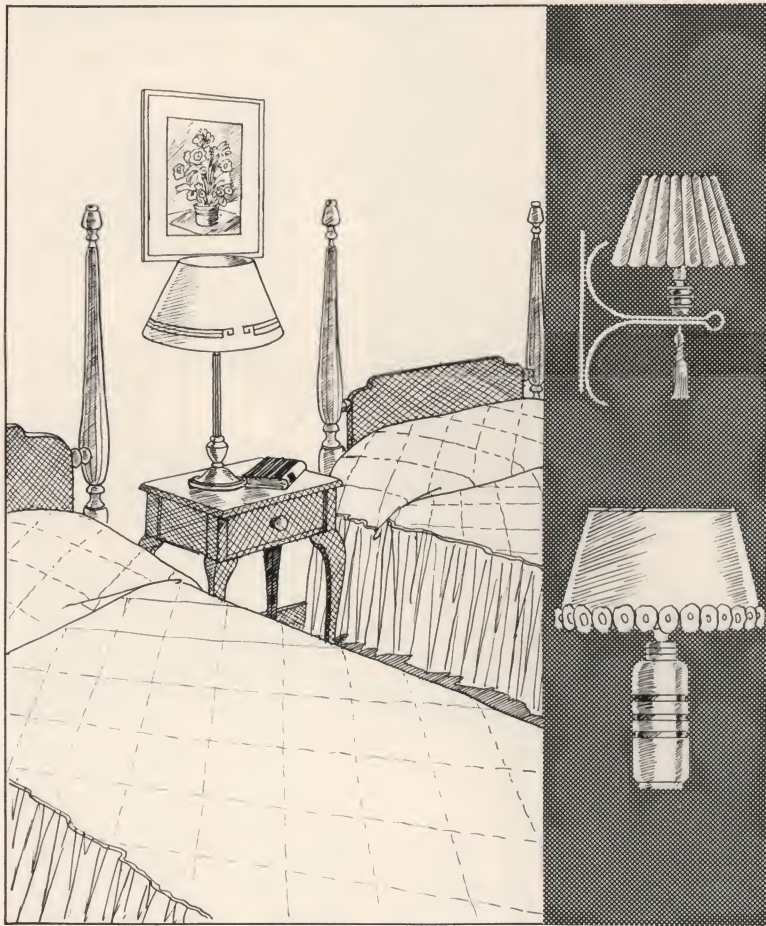
How card tables do need good light! And so seldom get it. This one does, however, with an indirect lamp. Its "Indirect Three-Lite" MAZDA lamp is turned to its highest intensity, for concentrated playing. The metal or glass torchiere lamp, right, is also excellent.



Shades can make or break a lamp. All shades in the home should be light in color. On the bedroom dressing table, however, they should be white to give a neutral light for applying cosmetics. A 60-watt bulb in a shade that is 8 inches wide at the bottom and on a level with the user's face is needed. The cylindrical shade is an interesting variation from the more usual types.



These lamp shades are on the level! With your face, that is, as all good lamps on dressing table or chest of drawers are. Height of standards is therefore governed by the height of furniture and user. The lamps, each equipped with a 60-watt bulb, should be selected accordingly.



The I. E. S. Better Sight Study Lamp keeps bobbing up everywhere! This model, with shade 16 inches wide, is not too large for a sturdy bedside table; it gives a generous spread of light. The popular wall bracket lamp is another suggestion for reading in bed. It uses a 75-watt bulb.

Only recently introduced, plant lamps have met with immediate popularity. Research by horticulturists and lighting scientists revealed that a number of plants do markedly well under lamps. These floor, table and wall models are graceful and induce admiration in any home.



When the davenport or settee is placed away from the wall, a lamp is best placed back of it, whether it is a large floor lamp (preferably with both direct and indirect lighting units) or a large table lamp placed on a living room table behind the davenport.

The flat-top desk is best provided with adequate light by one of the new Study and Reading Lamps, specifications for which were created by the Illuminating Engineering Society. A lamp of proper height, with a diffusing globe surrounding the lower part of the lamp bulb, eliminating glare and directing some of the light upwards, and with a wide-spread shade whose white lining increases the amount of light by reflection, it is exceptionally desirable for seeing purposes. The floor type of Study and Reading lamp is readily adaptable for use beside the reading chair or behind the davenport. Beside the secretary desk it is highly recommended. Light for the secretary desk may, in addition, be furnished either by a bridge lamp (upturned type preferable) or ordinary junior floor lamp placed at the left of the desk.

The indirect lamp, or semi-indirect lamp (made according to I. E. S. specifications), the former made with a metal reflector, the latter with a translucent reflector allowing some light to shine downward, recommended as a means of furnishing general illumination for all purposes, is especially appreciated at the card table. This type of lamp is suitable for use at the piano, placed behind the piano bench either to the extreme right or left. The semi-indirect floor lamp along with the study and reading lamp made in accordance with the Illuminating Engineering Society specifications bring to the home types of equipment which provide a new order in both quantity and quality of lighting. These lamps now available in a wide variety of designs carry identifying tags of approval.

In the Bedroom

Bedrooms, like living rooms, have need of localized lighting, specifically at the dressing table, chiffonier, and the bed.

At the dressing table or chiffonier a pair of tall boudoir lamps, one at each side of the mirror, is recommended. They should be of such height as to bring the light source to the face level of the person looking into the mirror, and their shades should be white so as to reflect no distorting colors on the face.

For the lighting of the bed, rules similar to the lighting of a reading chair may be applied. The wall type portable lamp is especially applicable for this purpose, as well as a lounge lamp or an end table lamp.

Designed to furnish, simultaneously, light for both of twin beds, is the twin beside lamp, placed on a table between the beds.

The Plant Light

Plants need no longer be confined to sunlit areas in the home—but by means of the plant light may be placed in darkened nooks to make them attractive. This type of lamp equipped with a regular 60 to 150 watt standard MAZDA lamp bulb (the smaller lamp with wall types, the larger with floor types) will emit rays, research has discovered, under which certain plants will thrive.

Because of the development of the plant light, plants may now be placed anywhere in any room and not be confined only to sunlit areas, where it is often inconvenient to have them. Plant decoration may now make the darkened areas of a room attractive in light as well as life.

PORTABLE LAMP DESCRIPTIONS

Type of Lamp	Height of Lamp (Inches)	Sockets (Number)	Lamps (Number and Wattage)	Approximate Lamp Shade Dimensions— Bottom and Top Diameters— Depth (Inches)
Floor (tall)	60-64	2 or 3	2-60, or 2-40, 1-60	20 by 14 by 12 19 by 12 by 10
Junior Floor	55-60	2 or 3	1-60, 1-40, or 3-40-60	18 by 12 by 11½ 16 by 9½ by 9
Lounge Lamp	50-55	3	2-40, 1-25 1-60, 1-40 1-25	16 by 9 by 8½ 16 by 5 by 7
Bridge (upturned)		1	1-60-75	10 by 6 by 6
Bridge (downturned)		1	1-60-75	12 by 6 by 6½
Table Lamp (large)	23-26	2 or 3	2-60-75, or 1-60, 2-40	18 by 12 by 11½
Lamp for Low End Table	18-22	2 or 3	3-40, or 1-60, 2-40 2-60-75	16 by 9 by 8½
Lamp for High End Table	17-20	1 or 2	1-60-75, or 1-40, 1-60	12 by 7 by 8½
Dressing Table	18-22	1	1-60	8 by 5 by 5¾
Bedside Table	18-22	1 or 2	1-60-75, or 1-60, 1-40	12 by 6½ by 7
Pin-It-Up		1	1-60-75	10 by 3½ by 5½

ILLUMINATING ENGINEERING SOCIETY SPECIFICATION LAMPS

Study and Reading Lamp				
Table Type	28-29	1	1-100	16 by 8 by 9
Floor Type	58-59	1	1-100	16 by 8 by 9
Semi-Indirect				
Floor Type	63	1	1-250,* or 1-100-200-300**	19 by 12 by 10
Totally Indirect				
Floor Type	63	1	1-250* 1-100-200-300**	

*250-watt "Indirect-Lite" Mazda Lamp.

**100-200-300-watt "Indirect Three-Lite" Mazda Lamp.

WIRING SUGGESTIONS FOR LIGHTING AND APPLIANCES

(Abstracted from "Adequacy Wiring Standards for Residence Building")*

I. GENERAL

1. Lighting Outlets.

One or more ceiling outlets for lighting in every active room. Wall (bracket) outlets for lighting as scheduled in the discussion of individual rooms.

2. Switch Control.

Switches shall be provided at each main entrance to all rooms, halls, passages, and/or storage spaces, having thirty or more square feet of floor area. Three-way and four-way control shall be installed between all active floors and all main entrances to each room or hall in which entrances are more than ten feet apart; also in main building controlling at least one light in or on detached garage or other outbuilding.

3. Convenience Outlets.

All convenience outlets should be of the duplex type unless otherwise specified. They should be installed in or near the baseboard. The cord supplied with a portable lamp or an appliance is usually about six feet in length; hence to afford complete convenience an outlet should be available within six feet of any point where a portable lamp or an appliance may be used.

*Sponsored by Artistic Lighting Equipment Association; Association Electragists, International; Illuminating Engineering Society; National Electric Light Association; National Electric Manufacturers Association; National Electric Wholesalers Association; endorsed by International Association of Electrical Inspectors. Copies of these wiring standards may be obtained from any of the sponsoring organizations.

II. WIRING SUGGESTIONS FOR PARTICULAR LOCATIONS

1. Entrances and Porches—Lighting Outlets.

Two wall outlets at either side of front entrance where architectural arrangement permits, otherwise one wall or ceiling outlet. Outlet for illuminated house number. One ceiling or wall outlet for side and rear entrances. One ceiling outlet for covered porches; at least one outlet for every 100 square feet of floor area.

Switch Control: Switch for porch lights and lighted house number just inside entrance door. Switch at inside each door leading to any porch.

Convenience Outlets: Convenience outlets for decorative lighting at front entrance with additional outlets on all porches, floored terraces and patios to supply portable and decorative lighting, fans and other appliances.

2. Halls, Passages, Stairways.

Lighting outlets: One ceiling or wall outlet for lighting on each floor to illuminate the head and foot of stairways. Additional outlets if necessary to provide one for every fifteen feet of length of any hall.

Switch Control: The light for stairways is controlled by two switches, one at the foot of the stairway, another at the head. The lights in the first and second floor halls are controlled by two switches, one at foot of stairway and another in the second floor hall.

Convenience Outlets: At least one convenience outlet for every twelve feet of hall, for portable lamps, vacuum cleaner, clock and other appliances.

3. Living Room, Bedrooms, Reception Hall, Library, Den, Sun Room, Recreation Room, and Similar Rooms.

Lighting Outlets: One ceiling outlet for lighting in each room. At least two ceiling outlets for each room having an area in excess of 300 square feet and in which the length is more than one and one-half times the width. Wall outlets to provide either decorative or supplementary general illumination, placed symmetrically and with consideration of probable location of furniture.

Switch Control: See Section I.-2

Convenience Outlets: Outlets placed so that no point in any unbroken wall space is more than six feet from an outlet. At least one outlet placed in every wall space three feet or more in length. One outlet flush in the top of the mantel shelf, for clock and decorative lights.

Radio Connections: Radio ground and aerial connection adjacent to or in conjunction with convenience outlet should be provided in several of these rooms.

4. Dining Room, Breakfast Room, Breakfast Nook.

Lighting Outlets: One ceiling outlet in each such room or space. Wall outlets for decorative and supplementary general illumination, placed symmetrically and with consideration of location of furniture.

Switch Control: See Section I.-2

Convenience Outlets: A minimum of two convenience outlets to supply appliances in each room having an area of more than one hundred square feet with additional convenience outlets to provide at least one in every wall space adaptable to use of buffet serving table, etc. Where the dining room table will be placed against the wall, there should be one convenience outlet at table height. Where the dining table will be placed away from the wall, there may be a convenience outlet on the under side of the table.

5. Kitchen, Kitchenette, Pantry, Etc.

Lighting Outlets: One centered ceiling outlet with supplementary side-wall or ceiling outlets to provide local light at range, sink, and other work areas.

Switch Control: At each entrance into kitchen for ceiling fixture. Local lighting units controlled locally.

Convenience Outlets: Convenience outlets at the work table, kitchen cabinet and at work counters under upper wall cabinets. In addition outlets are particularly located for the refrigerator, dishwasher, clock, ironer, and ventilating fan. Special purpose outlets supply ranges and hot water heaters.

6. Bathroom and Lavatory:

Lighting Outlets: Wall outlets at each side of mirror, separated by thirty inches when possible. Their height above the floor should be such that the light source center of the fixture used is at face height—(about 5'-6"). A ceiling outlet in the center of the room for larger bathrooms. Ceiling outlet for vapor-proof fixtures, if bathtubs or showers are in separate compartments.

Switch Control: Lights at mirror and ceiling, controlled at switch, just inside door. Light in shower compartment controlled by switch outside the compartment.

Convenience Outlets: Outlet 3'-4' from floor and not adjacent to tub.

7. Closets.

Lighting Outlets: Ceiling or wall outlet in every closet three feet or more deep or having a floor area of ten square feet or more. A closet off of main hallway or off of small hallway connecting a bedroom to a main hall, should be provided with an additional ceiling outlet immediately in front of the closet door.

Switch Control: Ceiling light controlled by pull chain either beside door or automatically by the opening and closing of the door. Large Closets with center outlet controlled by wall switch at door.

8. Laundry.

Lighting Outlets: Ceiling outlets for lighting directly over laundry tubs or tray and over probable location of ironer or ironing board.

Switch Control: At entrance to laundry space for at least one ceiling fixture.

Convenience Outlets: The washing machine outlet is suspended five and one-half feet above the floor from an outlet box in the ceiling three feet in front of the laundry trays. Additional outlets conveniently located for connection of iron or ironer, hot plate and clothes dryer.

9. Basement and Attic.

(Finished rooms take specifications according to their use.)

Lighting Outlets: Ceiling outlet for lighting at foot of stairs (top of stairs in case of attic) and a ceiling outlet in each enclosed space, as well as in front of furnace and over work bench.

Switch Control: At foot and head of stairways leading to basement and attic.

Convenience Outlets: In the basement at least a convenience outlet for use of tools and at work bench. Additional outlets are considered for oil furnace, air conditioning units, bell ringing transformer, etc. In the attic at least one outlet in a suitable location.

10. Garage.

Lighting Outlets: Ceiling outlets over hood and rear of each car. One side wall outlet on exterior of garage. Garages with overhead opening doors may be provided for with two corner outlets at the rear of car and one over hood of car in single car garage. Employ same arrangement with two car garage, placing the forward over-hood outlet between the cars.

Switch Control: Light on exterior of garage controlled by switch inside the rear entrance of the house and also just inside garage door. All interior lights may be controlled by one switch in garage.

Convenience Outlets: One outlet on the rear wall at each car location installed about four feet above the floor.

11. Branch Circuits.

No wire smaller than No. 12 A. W. G. should be used for branch circuit work.

The number of circuits that supply the lighting outlets in all rooms and all convenience outlets except those in the dining room (or dinette), breakfast room, kitchen (or kitchenette), pantry and laundry, should be determined by providing one circuit for every five hundred (500) square feet of floor area of the house. (The floor area is computed from the outside dimensions of the house and should include all areas except open porches and unfinished space in basement and attic.) Outlets supplied by these circuits to be divided as equally as possible among all such circuits.

The convenience outlets in the dining room (or dinette), breakfast room, kitchen (or kitchenette), pantry and laundry, should be supplied by two circuits additional to the above and separate from lighting circuits. Each of the circuits to supply outlets in each of the rooms listed and the receptacles in each room to be divided as equally as possible between the two branch circuits.

Spare terminals for two circuits in addition to those initially required are suggested.

12. Service Entrance.

The service entrance should be at least three No. 6 A. W. G. conductors or conductors equivalent in capacity, with protective equipment of corresponding rating. Where capacity in excess of the above minimum is necessary, under the National Electric Code, to take care of the equipment installed or contemplated, the entrance wires and protective equipment should be increased in size in accordance with the requirements of that Code.

The following may be used as a basis for checking the size of service entrance equipment against the minimum standard recommended, to determine whether increased capacity will be required.

- (a) *The size of service entrance equipment required* is computed from the total of the wattages determined in (b) and (c) below.
- (b) *For lighting, portable appliances, and fixed appliances each less than 1500-watt rating*, allow two (2) watts per square foot for the first 2000 square feet of floor area, plus one (1) watt per square foot for the area in excess of 2000 square feet, plus 1000 watts.
- (c) *For fixed appliances each of 1500-watt rating or above*, total the wattage rating of the appliances installed or contemplated. Experience indicates that not all appliances will be used to full capacity at the same time, hence it may be necessary to install entrance capacity for the total rated wattage where two or more appliances each of 1500 watts or above are installed. The local inspection authority should be consulted on this point.

If both a range and water heater are installed and the water heater is so wired that it cannot be in operation while the full capacity of the range is being used, then the wattage rating of the water heater need not be included in determining the service entrance capacity.

The book section presents an interesting area through the use of an overhead luminous glass panel and metal reflectors built into the front edge of each shelf.



The light from the vertical panels of glass on each side of the dressing table completely reveal one's hair and face in the mirror.



The kitchen soffit unit provides an abundance of softened lighting comparable with a section of sky brought indoors.

“BUILT-IN” LIGHTING FEATURES

Lighting equipment built into the structure itself provides an excellent means of solving a number of both utilitarian and decorative problems. A simple and effective form is found with the light box which presents to view a surface of diffusing glass set flush with the wall or ceiling. Its simplicity, however, has lead to installations which have not been pleasing or effective for it has been relatively simple to provide some form of recess which is merely covered with any type of glass at hand. In addition, the necessary size of glass area and the placing of sockets have not been properly considered. Such types of installations too often produce non-uniform surfaces, which have been glaring, or else they failed to deliver the amounts of light which are desired for the particular service for which they were intended.

The delivered amount of light and the uniformity of brightness depend upon the kind of glass, the area of the glass, the spacing of the lamps, the depth and reflecting qualities of the inner surface of the enclosing box. Flashed or cased opal glass has proved to be one of the most satisfactory types to use since it is possible to get uniformity of the illuminated glass with boxes of the simplest construction and with the least depth of box. One type of this glass produces a rather greenish-white effect when lighted while the other is quite free from this greenishness. The latter is commonly known as flashed or cased glass with water-white crystal-base.

The area of the glass surface establishes roughly the amount of light which may be delivered and be free from glare. A flush panel six inches square cannot deliver, without becoming unduly bright, the quantity delivered by a panel two feet square since the latter has sixteen times the light-giving area. With the two-foot square at a comfortable level of brightness the brightness of the six-inch square would be definitely uncomfortable to view since it would be sixteen times as bright when it delivered the same amount of light.

To obtain good uniformity of illuminated glass with flashed or cased opal glass the following approximate spacing of lamp bulbs should be used:

<i>Lamp Bulb Center to Glass Surface</i>	<i>Spacing of Lamp Bulbs</i>
4 in.	6 in.
5	7½
6	9
8	12

It will be noted that the lamp bulb spacing is 1½ times the distance between the glass surface and the center of the lamp bulb. When the inner surface of the box has a high reflecting value, such as oxidized aluminum possesses, this ratio may be increased to 2 when the panel of glass is used overhead in such locations as book-case, window-seat and kitchen soffits, since in these locations the possible non-uniformity is not as noticeable as it would be when used in wall areas or in the center of a ceiling.

Normally boxes of excessive depth do not enter into consideration in residences since deep spaces are usually not available. Shallower spaces are more commonly encountered and accordingly the basic design features of lamp spacing must be closely adhered to.

Interior finish of the light box plays an important part in the delivered amounts of light and only the best finishes are economically practical. Permanence of finish is also an important factor. Such finishes as porcelain enamel and oxidized aluminum provide both high reflecting values and permanence.

As an indication of the effectiveness of well-designed, simple, flush-type units using flashed opal glass a few results of delivered light are given:

<i>Glass Dimensions</i>		<i>Number of Lamps</i>	<i>Size of Lamps</i>	<i>Footcandles*</i>
<i>Length</i>	<i>Width</i>			
34 in.	9 in.	3	60-watt	15
57 in.	8 in.	5	60-watt	20

*Intensity of illumination delivered on a horizontal plane 48 inches below the surface of the unit.

These units have the same general brightness found in a clear blue sky. Brightnesses materially higher than these, while often applicable in the display world, are to be avoided in the home since they are usually out of key with the atmosphere of the home and furthermore are not entirely comfortable to view. Reductions in width of boxes of these lengths of glass panels, for example, reduce the delivered intensities of illumination proportionately. Since it is not advisable to increase wattage of lamps as size of glass area is reduced, it becomes apparent that for major effectiveness, areas of glass such as are given in the above cases, are necessary for such services as the dishwasher, range and other working areas likewise, where reading, drawing or other close visual work is to be done. The dressing table mirror, bath mirror, full length mirror are all places for application of this form of panel. While space for panel widths of approximately five inches may not always be available for "built-in" dressing tables, bath mirrors, etc., a width of this magnitude is desirable to insure both comfortable brightness and adequate intensities of lighting. In these services the position of the persons face to be viewed may be ascertained and accordingly the distance from the flush panel of glass to the face may be established. As with any type of lighting arrangement the delivered intensity decreases as the distance between source and object increases. The factor of distance is accordingly important. The rate of decrease with distance is indicated in the following table. In this case the panel is 34 inches long and 5 inches wide and has three 60-watt lamps behind it properly spaced.

<i>Distance from glass panel to object lighted</i>	<i>Illumination delivered on object—Footcandles</i>
48 in.	9
36 in.	14
24 in.	23

If instead of 60-watt lamps 40-watt lamps were used a decrease in lighting approximately in proportion to the wattage decrease would result; the value at two feet for example would decrease to sixteen footcandles. Retaining the same depth of box and spacing of lamps, a reduction in the panel width to two and one-half inches would reduce the values in the preceeding table practically fifty per cent.

Where flush panels are used for decorative effects the delivered intensities become a matter of choice depending largely upon the general level of lighting of the surroundings. Values considerably less than those given in the previous tables would usually be in order since they do not serve for any of the closer visual occupations.

Flush panels used in the center of ceilings for general room illumination need careful consideration since their position is normally within the field of view of the occupants of the room. When moderate amounts of general lighting are to be produced low brightnesses of glass area result and the most pleasing effects are produced. These results are obtainable when each square foot of glass is supplied with lamp wattages which total 50 to 100 watts. These values in themselves indicate the need for areas of considerable size since the efficiency of these types of units is usually somewhat less than fifty per cent.

When the center flush panel fixture is considered it should be remembered that this unit does not provide any light directly on the ceiling. Allowing the panel to be dropped below the ceiling with side panels of matching glass improves this deficiency to some extent. Since such a high percentage of the light comes of necessity from the panel itself and is not assisted by the surrounding ceiling, auxiliary forms of lighting are highly desirable for reducing the contrast that otherwise prevails. This auxiliary lighting may be obtained from brackets, torchieres, portable lamps with open top shades, indirect lamps, or coves.

A form of "built-in" lighting is the indirect trough or cove. The cove itself should be depended upon for secondary lighting effects for if we attempt to create "seeing" intensities of lighting throughout an entire room we may create the feeling which conflicts with our desire to keep the home from taking on the air of a commercial interior. When however moderate or even low intensities of soft and even lighting throughout a room are to be provided the cove provides an excellent means of producing this effect.

In its best form there is reasonable evenness of light across the ceiling and a freedom from spottiness immediately above the cove. If the width of the room is great and the cove is close to the ceiling the spread of light across the ceiling will be limited. Lamps spaced apart from each other produces spottiness, the degree of spottiness increasing with the increases in spacing. This effect is also further emphasized with ceiling finishes which are glossy. In all cases mat surfaces or roughened ceiling finishes minimize spottiness and go far toward eliminating image reflections of the lamps themselves. The conventional types of sockets introduce spacings. The new type Lumiline MAZDA lamp, may be mounted end to end to form a practically continuous source of light which in turn eliminates spottiness and creates the greatest smoothness of light above the cove and out on the ceiling. As with all types of indirect lighting the ceiling and upper side walls must reflect all of the light to the room, therefore it is important to use very light finishes for these surfaces. The usual installations of complete cove extend around the four sides of the room. Very satisfactory results are also obtained in rectangular rooms when the cove is used on the two long dimension sides of a room. While space does not permit complete discussion of all the factors involved in the planning of cove lighting the results obtained from a typical installation will serve to illustrate the order of magnitude of delivered light in a room. For example, a room twenty-four feet long and sixteen feet wide, ceiling height nine feet, would have approximately five footcandles of illumination delivered from a continuous cove on the two twenty-four feet sides; when the wattage of lamps approximates twenty-five watts per lineal foot of cove.

In addition to the continuous cove the partial or non-continuous cove holds interesting possibilities and is also widely applicable. Sections of smaller cross-sectioned cove may be placed immediately above door and window openings to either form a part of the trim itself or to be applied on top of the trim. In the case of a large window opening the cove may be concealed with a lambrequin. In this case the effect may become of major importance since spaces and length are adequate for major effectiveness.

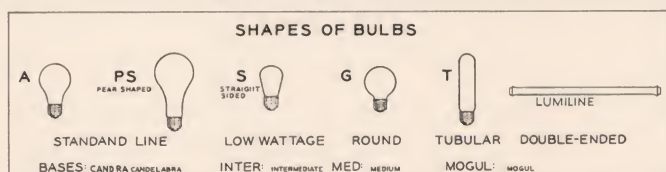
The smallest types of non-continuous cove, in being equipped with lamps that are small, six and ten-watt, usually serve for low secondary effects. While it is not entirely essential to exactly balance the placing of these sections the most balanced effects are produced when this is considered in the plan. For example a small cove over a single window is but part of a possible system and the entire effect will be limited to that part of the room in which it is used. On the other hand where door and window openings balance each other on opposite ends and sides of the room a completeness of installation results and the effect will prevail in all parts of the room.

Under the classification of "built-in" lighting there are considerable numbers of ideas which may be developed such as artificial windows, niches for paintings and statuary, stained glass panels, and in soffits over areas for built-in furniture. In each case care in design provides its reward in the form of the pleasure and satisfaction gained from the effective results which are readily obtainable. Light in the raw may mar the most effectively planned interiors whereas its complete controllability and its effectiveness as a decorative media as well as its relation to vision thoroughly warrants that the same consideration be given it that any home-making or decorating problem now receives.

Types and Sizes of MAZDA Lamps and Their Application in Residence Lighting

(For Service on Standard Lighting Voltages 110, 115, 120)

Watts	Bulbs	Overall Length (Inches)	Standard Line "A" Lamps		Application
			Base	Finish	
15	A-17	3-5/8	Med.	Inside Frosted	Decorative portable lamps and wall brackets
25	A-19	3-15/16	Med.	Inside Frosted	Decorative wall brackets and pockets.
25	A-19	3-15/16	Med.	Fl. Tint or Ivory	Decorative lighting effects.
40	A-19	4-1/4	Med.	Inside Frosted or Ivory	Ceiling fixtures, wall brackets and portable lamps.
40	A-19	4-1/4	Med.	Flametint or Ivory	Decorative lighting effects.
50	A-21	4-15/16	Med.	Inside Frosted	Ceiling fixtures, wall brackets and portable lamps.
60	A-21	4-15/16	Med.	Inside Frosted	Ceiling fixtures and Portable Lamps.
75	A-21	5-5/16	Med.	Inside Frosted	Ceiling fixtures and Portable Lamps.
100	A-23	6-1/16	Med.	Inside Frosted	Ceiling fixtures and Portable Lamps.
400 (App.)	PS-22	-----	Sunlight Lamp Type S-1	Inside Frosted	These lamps will not operate on ordinary house lighting circuits except when used in special equipment properly designed to produce the correct starting and operating voltage for it.
130	A-17	-----	Mogul Sunlight Lamp Type S-2 Special	Inside Frosted with Metal Cap	
150	PS-25	6-15/16	Standard Line "PS" (Pear Shaped) Bulbs	Inside Frosted	Enclosing globes and semi-indirect ceiling fixtures.
200	PS-30	8-1/8	Standard Line "PS" (Pear Shaped) Bulbs	Med.	Indirect ceiling fixtures and portable lamps.
300	PS-35	9-7/16	Mogul	Inside Frosted	Indirect ceiling fixtures and portable lamps.
25	T-6 1/2	5-1/2	Tubular "T" Lamps		Decorative fixtures
25	T-10	5-3/8			Book-shelf lighting
40	T-8	11-7/8			Brackets, fixtures and coves
75	T-10	11-7/8			Special applications
75	T-10	11-7/8			Special applications
100	T-12	34			Special applications
150	T-10	11-7/8			Special applications
40	T-8	12	Double-Ended Special	"Lumiline" Lamps Inside Frosted	Ceiling lighting fixtures, wall fixtures "Built-in" lighting-coves.
30	T-8	18			
60	T-8	18			
3	S-6	1-7/8	Low-Wattage Candelabra	"S" Bulbs	For decorative lamps, illuminated house numbers and coves.
6	S-6	1-7/8			
6	S-11	2-5/16			
6	S-14	3-1/2			
10	S-11	2-5/16			
10	S-14	3-1/2	Medium		
25	G-18 1/2	3-9/16	Round "G" Bulbs		Decorative wall brackets and lamps.
25	G-25	4-7/16			
40	G-25	4-7/16			
250	G-30	6-1/2	Medium	Inside Frosted	Indirect and semi-indirect portable lamps
100/200/300	G-30	6-3/4	Mogul-3 contact	Inside Frosted	Indirect and semi-indirect portable lamps



Incandescent lamp bulbs are designed by number and letter, the number indicates the diameter in eighths of an inch; the letter indicates the shape as above. Thus, A-19 designates a standard line lamp having a diameter of nineteen eighths of an inch, or 2 3/8 inches.

